CBF-PERIDB: A CHINESE BAMBOO FLUTE DATASET FOR PERIODIC MODULATION ANALYSIS

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EXTENDED ABSTRACT

We present *CBF-periDB*, a dataset of Chinese bamboo flute performances for ecologically valid analysis of periodic modulations in context. The dataset contains monophonic recordings of four types of isolated playing techniques and twenty expert full-length performances of classic Chinese bamboo flute pieces. Four types of playing techniques—vibrato, tremolo, trill, and flutter-tongue—are thoroughly annotated by the players themselves. These techniques are also referred to as periodic modulations due to their periodic patterns in the time-frequency domain. All recordings and annotations can be downloaded from c4dm.eecs.qmul.ac.uk/CBFdataset.html.

Playing techniques are important elements of expressive music performance, which are present regardless of genre, instrument type, and absolute pitch. The pervasiveness of playing techniques makes their analysis an attractive task in music information retrieval. The results of such analysis will inform research on automatic ornamentation transcription, realistic music generation, computer-aided music pedagogy, instrument classification, and performance analysis.

Previously published datasets for playing technique or vocal technique analysis focus primarily on techniques recorded in isolation [1, 4], such as playing techniques on each note of the musical scale. Recent findings show that playing techniques exhibit considerable variations during live performance in contrast to when they are played in isolation [3]. The rarity of a specific playing technique in one piece and the requirement of annotating expertise hinder the collection of data in real-world performances. In current research on playing techniques, the focus has mostly been on Western instruments. The more evident inter-performer variability in folk music has not been widely explored.

The Chinese bamboo flute (also known as the *dizi* or *zhudi*, thereafter abbreviated as CBF), is one of the world's most ancient instruments with a large repertoire of playing techniques. Based on consultation with professional CBF players, educators, and researchers, we create *CBFdataset*: a dataset of Chinese bamboo flute performances. The dataset comprises of monophonic recordings of representative CBF playing techniques and of classic CBF pieces representing diverse players, flute types, pieces, styles, and conservatories.

CBF-periDB, released as CBFdataset V1.0, is a subset of the CBFdataset, specifically created to facilitate research on periodic modulations [2]. This dataset is recorded by ten professional CBF players from the China Conservatory of Music. All data is recorded in a professional recording studio using a Zoom H6 recorder at 44.1kHz/24-bits. Each player performs both isolated periodic modulations covering all notes on the CBF and two full-length pieces from the list: *Busy Delivering Harvest* «扬鞭催马运粮忙», *Jolly Meeting* «喜相逢», *Morning* «早晨», and *Flying Partridge* «鹧鸪飞». Players are grouped by flute type—C and G, the most representative types for Southern and Northern styles, respectively—and each uses their own flute.

The four types of periodic modulations, as shown in Figure 1, in CBF-periDB are carefully annotated by the players themselves. Annotations of each playing technique in the recordings include both the onset-offset information and the playing technique label. For modulations with relatively long duration, such as vibratos, tremolos, and trills, the annotations follow the convention that each playing technique segment must contain

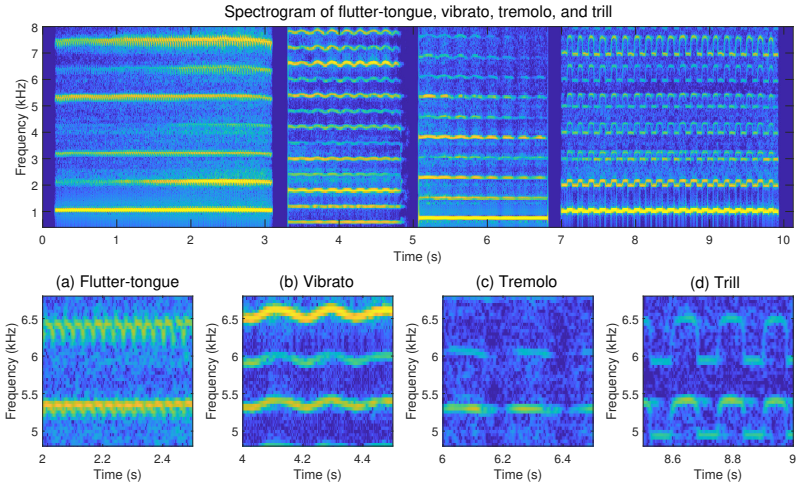

Figure 1. Spectrograms of periodic modulations.

at least three modulation units. The modulation unit refers to the basic unit pattern that repeats periodically within the modulation [2]. For overlapped playing techniques, each playing technique is annotated separately. Details of recording length and the total duration of all periodic modulations in each piece are shown in minutes in Table 1. Tremolos are not recorded in isolation due to their frequent application in pieces.

Type	**Isolated**	**Performed**			
	Total length	Piece	#	Modulation length	Total length
Flutter-tongue	4.9	*Morning*	3	3.9	16.0
Vibrato	7.3	*Busy Delivering Harvest*	7	6.1	28.0
Tremolo	/	*Jolly Meeting*	4	2.8	12.4
Trill	8.5	*Flying Partridge*	6	11.5	51.9

Table 1. Length of recordings and total duration of periodic modulations in each piece in the CBF-periDB.

Besides CBF-periDB, there are two other subsets in the CBFdataset: CBF-evolDB and CBF-extendDB, which cover other CBF playing techniques and a large number of full-length pieces. These subsets are being prepared for public release. We will continuously release all data in the CBFdataset as they become ready, to facilitate computational research on music playing techniques.

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